SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

RELATED DOCUMENTS

All drawings and general provisions of the contract, including General Conditions, Supplementary Conditions, and other Division 1 Specifications, apply to this section.

Separation of Specifications into Sections is for convenience only and is not intended to establish limits of work or liability. The following sections apply to this project:

16010 – Basic Electrical Requirements
16100 – Basic Electrical Materials and Methods
16400 – Panelboards
16500 – Lighting Fixtures
16600 – Fire Detection System
16650 – Intrusion Detection System
16670 – Access Control System
16700 – Telecommunications Cable Plant
16750 – Intercom System
16760 – Video Surveillance System

DESCRIPTION OF WORK

Furnish all labor, tools, materials, fixtures, equipment, accessories, transportation, etc., required for a complete electrical lighting and power systems, complete with necessary auxiliaries as indicated on the drawings and specifications.

Also included in the work is the power wiring for connection of items indicated on the architectural plans, as well as power wiring for the equipment specified in DIVISION 15 – MECHANICAL.

Removal of existing electrical equipment not being reused.

DRAWINGS AND SPECIFICATIONS

The drawings showing the layout of electrical work indicate the approximate location of transformers, switchboards, panelboards, disconnects, outlets, and conduit routing. The contractor shall refer to architectural, structural, and mechanical drawings as well as equipment

manufacturer's shop drawings and rough-in drawings, and adjust work accordingly to provide a coordinated installation. All adjustments and minor deviations necessary shall be made without additional cost to the owner. It shall be the electrical contractor's responsibility to see that all equipment such as pull boxes, junction boxes, panelboards, and other apparatus, that may require maintenance from time to time, are made accessible. Any condition that may occur during construction which conflicts with accessibility to the proposed installation of the electrical equipment, shall be brought to the Architect's attention prior to the point at which a change in location would require additional cost and delays to construction. The contractor shall install fire alarm devices as near as possible to the locations indicated on the drawings but shall move them as necessary to avoid conflicts with existing equipment and to be located sufficiently away from heat producing objects.

The drawings and specifications are complementary and what is shown and/or called for on one shall be furnished and installed the same as if shown and/or called for on the other.

Where the Contractor is not certain about the method of installation, he shall ask the Architect for further installation details. Lack of details, not requested, will not be an excuse for improper installation.

When a color or other condition for a product is specified to be determined by the architect, the submittal for that item shall be clearly marked with the available options. (Do not select a color or other condition in the submittal.) The architect shall be specifically asked by the contractor to provide the required information, and that product shall not be ordered prior to obtaining such information.

LAWS, CODES, AND PERMITS

The latest accepted edition of the National Electrical Code (NFPA 70), National Fire Alarm Code (NFPA 72), and all State building codes shall be considered a part of these specifications, and pertinent articles will not be repeated herein. These codes establish the minimum acceptable criteria where more stringent requirements have not been defined in these specifications and/or drawings.

This Contractor shall give notice to the proper authorities in ample time for the work to be inspected and approved as it progresses, and no work shall be concealed until inspected and approved by authorized inspectors. If the plans or these specifications in any way conflict with the referenced codes, these latter are to be followed, without expense to the Owner, but the Architect shall be notified of this condition and approval secured before changes are made.

No work shall be concealed until approved by the Architect.

The contractor shall assure that he does not install electrical equipment including raceways in or through areas restricted by the international building code including elevator shafts and stairs.

JOB SITE

Prior to submitting quotation for electrical work, Contractor shall visit and examine the job site with all authorities concerned in order to become familiar with all existing conditions pertinent to the work to be performed thereon. No additional compensation will be allowed for failure to be so informed.

Where existing equipment including raceways and wiring is in conflict with work of this project, the contractor shall rework/reroute/relocate this equipment as necessary.

TEMPORARY POWER

The Contractor shall be responsible for providing temporary light and power to the construction site as necessary to meet all of the OSHA requirements for construction, and as required by the general contractor and various sub-contractors.

WARRANTY

The contractor shall guarantee all labor and materials for a period of twelve (12) months from the date of final acceptance. All defective materials and work shall be replaced with new materials or equipment. This shall come at no additional cost to the Owner.

PART 2 – PRODUCTS

MATERIALS

Equipment and materials shall be new and shall be listed by Underwriters Laboratories for the purpose for which they are being used, and for the location where installed. All material of similar use shall be of the same manufacturer.

Substitutions to materials listed on the drawings and specifications with manufacturer and model number shall be prior approved in accordance with the bid requirements listed in the general and supplementary conditions of the specifications. Where no manufacturer or model number is listed, materials used shall meet the requirements of the drawings and specifications, and shall be listed for the use and installation intended.

All termination lugs shall be rated 75 degree C minimum and shall be compatible with the number and size of wires to be terminated.

SUBSTITUTIONS

Names of manufacturers or catalog numbers are mentioned herein in order to establish a standard as to design quality. Other products similar in design and of equal quality may be used if submitted to the architect and found acceptable by him. Refer to the general conditions for additional information.

Any substitution to items specified, that are not approved prior to bidding, shall be brought to

the attention of the architect and engineer as an alternative product prior to the official submittal of electrical products.

When the contractor elects to use an acceptable alternate manufacturer's equipment, the contractor shall be responsible to coordinate the change with all trades affected and pay for any additional work required under this or any other division affected by the substitution.

SUBMITTALS

Within thirty days of the award of the contract, the Contractor shall be responsible for submitting six (6) copies of submittals containing catalog cuts and performance data for all material and equipment proposed for use. These submittals shall be reviewed by the Architect for general compliance to the contract documents. The Architect's review of these submittals in no way modifies the contract or relieves the Contractor from compliance with the contract unless a difference is clearly stated in the submission and specific acceptance is given by the Architect as a change to the contract.

Submittals shall be identified with the project name and the contractors name and have the contractor's stamp showing that he has reviewed the submittal and found it to be in accordance with the plans and specifications. Items of division 16 shall be submitted in one package.

Submittals that do not comply with the above will be returned, without review, for resubmission.

All shop drawings must be reviewed before the various factories start fabrication.

PART 3 – EXECUTION

INSTALLATION

Ask for details whenever uncertain about installation method. Lack of details requested shall not excuse proper installation and corrections shall be the responsibility of the contractor.

CLOSE-OUT DOCUMENTATION

The Contractor shall be responsible for providing close-out documentation, including as-built documents on all operating manuals in accordance with other parts of the specifications.

CUTTING AND PATCHING

The Contractor shall be responsible for all cutting and patching that is required to complete the installation of the electrical systems. All work shall be coordinated between trades with strict accordance with the requirements of the General Conditions. Structural members shall not be cut or modified without the approval of the architect.

The Contractor shall be responsible for covering, caulking, or otherwise to make weatherproof

all openings left in the structure for electrical work. This includes openings around conduit penetrations.

EXCAVATING AND BACKFILLING

The Contractor shall be responsible for all excavating and backfilling required to complete the installation of the electrical systems. All excess material and debris shall be removed. All backfilling shall be with sand. Backfilling shall be thoroughly tamped and compacted.

It shall be the Contractor's responsibility to locate all underground utilities before trenching and excavating. Care shall be taken to avoid damage to the existing utilities. Any damage shall be repaired or replaced by the Contractor at no expense to the Owner.

PAINTING

No painting shall be required under DIVISION 16, except for factory-finished items. Any damaged surfaces of factory items shall be repaired by the Contractor to an acceptable level determined by the Architect.

END OF SECTION 16010

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SECTION 16100

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Raceways.
2. Wires, cables, and connections
3. Wiring devices
4. Grounding
5. Safety Switches and fuses
6. Supporting devices for electrical components.
7. Equipment for utility company's electricity metering.

1.02 QUALITY ASSURANCE

Electrical Components, Devices, and Accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
Devices for Utility Company Electricity Metering shall comply with utility company published standards.
Comply with NFPA 70.

1.03 COORDINATION

Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.

Coordinate electrical service connections to components furnished by the University and its distribution system.

Coordinate installation and connection of exterior underground utilities.

Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.01 RACEWAYS

EMT: Electrical metallic tubing; ANSI C80.3, zinc-coated steel.

FMC: Flexible metal conduit; zinc-coated steel.

IMC: Intermediate metal conduit; ANSI C80.6, zinc-coated steel, with threaded fittings.

LFMC: Liquidtight flexible metal conduit; zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

RMC: Rigid metal conduit; galvanized rigid steel; ANSI C80.1.

RNC: Rigid nonmetallic conduit; NEMA TC 2, Schedule 40 or 80 PVC, with NEMA TC3 fittings.

Raceway Fittings: Specifically designed for raceway type with which used.

2.02 WIRES, CABLES, AND CONNECTIONS

All conductors shall have 600V insulation type THHN/THWN

Conductors, No. 10 AWG and Smaller: Solid or stranded copper.

Conductors, Larger Than No. 10 AWG: Stranded copper.

No wire shall be smaller than #12 AWG unless noted otherwise.

All conductors shall be copper.

Insulation: Thermoplastic, rated 600 V, 90 deg C minimum, Type THHN-THWN, or USE depending on application.

Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.03 WIRING DEVICES

Wall Switches shall be 20A, 277V, AC type designed for quiet operation.

Duplex receptacles shall be 20A/2 pole, 3-wire, 125V, grounding type.

All devices shall be specification grade Hubbell, Leviton, or equal.

All device plates shall be brushed stainless steel with matching counter sunk screws unless noted otherwise.

Consult with the Architect for color selections before ordering devices.

Use multigang plates where devices are grouped together.

Boxes and fittings shall comply with article 314 of the NEC. Particular attention shall be paid to the number of conductors allowed in an outlet box or junction box. Contractor shall make provisions to prevent overcrowding outlet and junction boxes regardless of the number of conductors shown on the plans at the outlets.

In locations where power, combination, and tele/data outlets are mounted together, care shall be taken to minimize the overall spacing along the wall. Consult with the Architect for specific details.

2.04 GROUNDING

The grounding system shall be in accordance with N.E.C. Article 250.

A grounding conductor shall be provided in all conduit.

2.05 SAFETY SWITCHES AND FUSES

Safety switches shall be of the quick-make, quick-break, heavy-duty, fusible or non-fusible type with cover interlock to prevent opening of the door when the switch is in the "ON" position. Use NEMA 3R enclosures outdoors and NEMA 1 enclosures indoors, unless otherwise noted.

Provide a complete set of dual-element, class RK-1 or class J fuses of ampere rating shown on the drawings. Furnish the owner with 20% spare fuses with at least one set for every rating.

All fuses shall have a minimum interrupting rating of 100,000 A.

2.06 SUPPORTING DEVICES

Material: Cold-formed steel, with corrosion-resistant coating.

Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.

Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.

Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

Expansion Anchors: Carbon-steel wedge or sleeve type.

Toggle Bolts: All-steel springhead type.

PART 3 - EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 RACEWAY APPLICATION

Outdoor Installations:

1. Exposed: RMC.
2. Underground, Single Run: RNC.
3. Underground, Grouped: RNC.
4. Connection to Vibrating Equipment: LFMC.
5. Boxes and Enclosures: NEMA 250, Type 3R or Type 4, unless otherwise indicated.

Indoor Installations:

1. Exposed: EMT except in wet or damp locations, use IMC.
2. Concealed in Walls or Ceilings: EMT.
3. In Concrete Slab: RNC.

4. Below Slab on Grade or in Crawlspace: RNC.
5. Connection to Vibrating Equipment: FMC; except in wet or damp locations: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.03 RACEWAY AND CABLE INSTALLATION

Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

All conduits shall be installed with runs arranged perpendicular to walls and ceilings.

Keep legs of raceway bends in the same plane and keep straight legs of offsets parallel.

Install pull wires in empty raceways. Leave at least 12 inches of slack at each end of pull wires.

Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inches flexible metallic conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

Set floor boxes level and trim after installation to fit flush to finished floor surface.

Unless a larger size is indicated, raceways, troughs, and junction boxes shall be sized in accordance with the fill requirements of the NEC.

Provide color-coding of wires and mark panels in accordance with NEC article 210.5 (C) and NEC article 215.12 (C) when more than one voltage is present for branch circuits.

3.04 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

Application: Use wiring methods specified below to the extent permitted by applicable codes as interpreted by authorities having jurisdiction.

Exposed Feeders: Insulated single conductors in raceway.

Concealed Feeders in Ceilings, Walls, and Gypsum Board Partitions: Insulated single conductors in raceway.

Concealed Feeders in Concrete: Insulated single conductors in raceway.

Exposed Branch Circuits: Insulated single conductors in raceway.

Concealed Branch Circuits in Ceilings, Walls, and Gypsum Board Partitions: Insulated single conductors in raceway.

Branch Circuits in Concrete: Insulated single conductors in raceway,

Underground Feeders and Branch Circuits: Insulated single conductors in raceway.

Remote-Control Signaling and Power-Limited Circuits, Classes 1, 2, and 3: Insulated conductors in raceway unless otherwise indicated.

Not Allowed: Type MC or NM for branch circuits.

3.05 WIRING INSTALLATION

Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

No wires shall be pulled in until the conduit system is complete. Ideal "Yellow 77" or other approved pulling lubricant shall be used.

3.06 ELECTRICAL SUPPORTING DEVICE APPLICATION

Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.

Dry Locations: Steel materials.

Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

3.07 SUPPORT INSTALLATION

Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

Size supports for multiple raceways or cable runs so capacity can be increased by a 25 percent minimum in the future.

Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.

Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:

(a) Wood: Wood screws or screw-type nails.
(b) Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.

(c) Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
(d) New Concrete: Concrete inserts with machine screws and bolts.
(e) Existing Concrete: Expansion bolts.
(f) Structural Steel: Spring-tension clamps.
(g) Light Steel Framing: Sheet metal screws.
(h) Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
(i) Light Steel: Sheet-metal screws.
(j) Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.08 IDENTIFICATION MATERIALS AND DEVICES

Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines.

3.09 FIRESTOPPING

Penetrations through rated construction shall be sealed with a material capable of preventing the passage of flames and hot gases when tested in accordance with ASTM-EB14.

1. Notify the Architect for inspection of all completed fire and/or smoke barrier walls before any construction is installed that would conceal construction and prevent a proper inspection. Access to random selected areas may be required by the Architect at the time of final inspection if this notification is not given.

2. Provide detailed instructive cut sheets of the fire penetration sealing system used to the Architect at the time of inspection. Random selective sampling by the Contractor will be observed by the Architect and the Fire Marshal's inspector.

3.10 MOUNTING HEIGHTS

Unless otherwise noted on the drawings or required by the Architect, the following mounting heights shall apply. Unless noted otherwise, mounting heights are to the centerline of the device:

1. Receptacles 18" above floor

2. Toggle Switches 48" above floor
3. Panelboards 72" to top
4. Telephone Outlets 18" above floor
5. Data Outlets 18" above floor
6. Meter Can 60"-72" to centerline

Mounting heights may be adjusted in masonry applications to simplify installation where approved by the Architect.

END OF SECTION 16100

SECTION 16400

PANELBOARDS

PART 1 – GENERAL

SUMMARY

This Section includes distribution and branch-circuit panelboards.

SUBMITTALS

Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

Shop Drawings: For each panelboard, including the following:

(a) Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following data:

i) Enclosure types and details for types other than NEMA 250, Type 1.
ii) Bus configuration, and current, and voltage ratings.
iii) Short-circuit current rating of panelboards and overcurrent protective devices.
iv) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.

(b) Wiring Diagrams: Power, signal, and control wiring.

Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

Operation and maintenance data.

QUALITY ASSURANCE

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Comply with NEMA PB 1.

Comply with NFPA 70.

PART 2 – PRODUCTS

MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

(a) Eaton Corp.; Cutler-Hammer Products.
(b) Siemens Energy & Automation, Inc.
(c) Square D Co.
(d) General Electric

FABRICATION AND FEATURES

Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, suitable for environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

Directory Card: A clear plastic directory holder shall be mounted inside panelboard door.

Bus: Hard-drawn copper, 98 percent conductivity.

Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

Panelboard Short-Circuit Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

Panelboards with Main Service Disconnect: Listed for use as service equipment.

Spaces for Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

Feed-through Lugs: Locate at opposite end of bus from incoming lugs or main device.

LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

DISTRIBUTION PANELBOARDS

Doors: Front mounted, and secured with vault-type latch with tumbler lock; keyed alike.

Branch overcurrent protective devices shall be one of the following:

(a) Bolt-on circuit breakers.
(b) Fused switches.

INTEGRATED TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICES

Surge Protective Device (SPD)

1. SPD shall be Listed and Component Recognized in accordance with UL 1449 Second Edition to include Section 37.3 highest fault current category. SPD shall be UL 1283 listed.
2. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory.
3. The TVSS devices in lighting and appliance panelboards shall be bus mounted between the main and branch devices. TVSS devices bussed off the end of the panelboard are not allowed. Panelboards with TVSS will accommodate thru-feed lugs and sub-feed circuit breakers in single section and multi-section panelboards.
4. The TVSS devices in power distribution panelboards shall be cable connected.
5. SPD shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G in WYE systems.
6. SPD shall be modular in design. Each mode including N-G shall be fused with a 200kAIR UL recognized surge rated fuse and incorporate a thermal cutout device. TVSS shall safely reach an end-of-life condition when subjected to fault current levels between 0 and 200 kA, including low level fault currents from 5 to 5000 amperes.
7. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided.
8. SPD shall meet or exceed the following criteria:
   a. Minimum surge current capability (single pulse rated) per phase shall be:
      1) Service Entrance Panelboard locations: 240kA per phase
      2) Distribution and lighting and Appliance Panelboard locations: 160kA per phase
   b. UL 1449 Suppression Voltage Ratings:

VOLTAGE	LOCATION	L-N	L-G	N-G

208Y/120V	Distribution:	400V	400V	400V
480Y/277V	Distribution:	800V	800V	800V

9. SPD shall have a minimum EMI/RFI filtering of up to –30 dB over the range of 100 kHz to 100 MHz.
10. SPD shall be provided with one set of NO/NC dry contacts.
11. The manufacturer of the electrical equipment in which the TVSS is installed shall warrant the integrated TVSS device to be free from defects in material and workmanship for a period of ten (10) years from the date of invoice the manufacturer or its authorized sales channel.

OVERCURRENT PROTECTIVE DEVICES

Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: Single- and two-pole configurations with 5mA trip sensitivity.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage. Verify exact voltage of shunt trip with fire alarm vendor.

Fused Switch: NEMA KS 1, Type HD; clips to accommodate indicated fuses; lockable handle.

PART 3 - EXECUTION

INSTALLATION

Install panelboards and accessories according to NEMA PB 1.1.

Mounting Heights: Top of trim 86 inches above finished floor, unless otherwise indicated. Highest switch or breaker at 72" max above finished floor.

Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

Install filler plates in unused protective device spaces.

Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

Locate panelboards so that ratings are not reduced by heat from external sources.

IDENTIFICATION

Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."

Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

FIELD QUALITY CONTROL

Testing and Inspection: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 16400

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SECTION 16500

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Lighting fixtures with lamps and ballasts.
   2. Emergency lighting units.
   3. Exit signs.
   4. Accessories, including fluorescent fixture dimmers, occupancy sensors, etc.

B. All existing lighting fixtures within each building are presumed to be functional. Contractor shall re-lamp each fixture, and clean the lens and any visible finish of the housing or trim ring. Upon energizing the lighting circuit, Contractor shall also test each fixture for full operation. Any fixture not operational shall be tested by the contractor to determine the reason for failure, and provide a written report to the Architect identifying the type and location of each inoperative fixture. Contractor shall also provide a cost to repair/replace all inoperative lighting fixtures. Upon acceptance of change order, provide submittals as listed below for all new lighting fixtures required, with all new fixtures matching existing fixture types as close as reasonable using standard manufacturer's offerings, and meeting the specifications as listed below.

C. Where called for on drawings, provide new light fixtures as scheduled on the drawings and specified herein.

1.02 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, photometric data, accessories, and finishes.

B. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.

C. Operation and maintenance data.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Fixtures for hazardous locations shall be listed by Underwriters' Laboratory and labeled for indicated class and division of hazard.

D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

PART 2 – PRODUCTS

A. All light fixtures shall be as specified on the drawings.

B. Fixtures to be installed in damp or wet locations shall be listed by Underwriters' Laboratory for that purpose.

C. Recessed incandescent fixtures shall be provided with thermal protectors to automatically deactivate the fixtures due to overheating (fixtures shall be labeled by Underwriters' Laboratory for that purpose).

D. Lamps shall be furnished and installed for all fixtures including fixtures furnished by others. Provide lamps of the proper type, wattage and voltage rating as specified in the contract documents.

E. Fluorescent dimmers and fluorescent dimming ballasts shall be manufactured by the same manufacturer.

F. Ballasts for operation of all fluorescent lamps shall be HPF Electronic with Class A Sound Rating.

G. Fluorescent ballasts for operation of F32 T8 rapid start lamps shall be electronic high-efficiency type with the following characteristics:
   1. Lamps shall operate in rapid start mode.
   2. Operate multiple lamps as parallel circuit, operating remaining lamps at full light output upon failure of other lamps connected to the same ballast.
   3. Individual ballasts specifically designed and UL Listed are to operate one, two, three, or four lamps as scheduled on the drawings.
   4. Operate lamps at a frequency higher than 20 kHz.
   5. Operate a rated circuit voltage (120 OR 277 VAC) at an input frequency of 60 Hz, and tolerate +/- 10% sustained voltage variation without damage to the ballast, and maintain light output at +/- 10% voltage variation.
   6. Comply with EMI and RFI limits set by the FCC (CRF 47 Part 18) for non-consumer applications and not interfere with normal electrical equipment.
   7. Power Factor shall be not less than 0.95.
   8. Total Harmonic Distortion shall be less than 10%.
   9. Lamp Crest Factor shall be 1.7 or less.
   10. Ballast Factor shall be greater than 0.85 and less than 1.00.
   11. Sound rating shall be "A".
   12. Withstand transients shall be as specified by ANSI C.62.41 for location category A.
   13. Shall comply with applicable ANSI standards.
   14. Shall be provided with a three (3) year warranty.

H. Fluorescent ballasts for operation of T5HO lamps shall be electronic high-efficiency type, program-start.

I. Exit signs shall be LED, and comply with UL 924; for exit sign colors and lettering size, comply with authorities having jurisdiction.

PART 3 – EXECUTION

A. Light fixtures shall be set level, plumb, and square with ceilings and walls.

B. Light fixtures in or on Grid-Type Suspended Ceilings shall be supported independently of the ceiling.

C. Fixtures to be installed in or on painted ceilings and/or walls shall not be installed until painting is completed. Fixtures installed with paint applied over factory finishes will be rejected.

D. Recessed fixtures shall be installed so that the trim flanges fit tightly and evenly against the surface of the ceiling.

E. All locations of fixtures are approximate. The contractor shall refer to architectural plans for exact locations.

F. For acoustical tile ceilings, surface fixtures shall be centered on a tile or a tile joint, unless noted otherwise.

G. All incandescent lamps shall be furnished inside frosted except where noted otherwise.

H. T8 fluorescent lamps shall be four (4') feet long, bi-pin, rapid or instant start, 3500 K, 85 CRI, except where noted otherwise.

I. All H.I.D. lamps shall be phosphor coated, wattage as specified in the drawings.

END OF SECTION 16500

BLANK SHEET

SECTION 16600

FIRE DETECTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section of the specifications includes the furnishing and installing, of a complete and operational Fire Alarm System. The system shall be analog, addressable, with voice evacuation.

B. The fire alarm system shall include, but not be limited to, alarm initiating devices, alarm indicating appliances, control panel(s), auxiliary control devices, annunciator, data communications equipment and software, and wiring required to form a complete coordinated system ready for operation. This Contractor shall furnish technical labor, controls equipment, ancillary control devices, installation materials and supervision to insure proper installation.

C. The fire alarm system shall comply with requirements of NFPA Standard 72 for protected premises signaling systems except as modified and supplemented by this specification. The system shall electrically supervise and monitor the integrity of all conductors.

D. The fire alarm system shall also be equipped to communicate with an off-site remote monitoring station via standard telephone line.

1.02 SCOPE

A. A complete and new installation shall be provided, consisting of all devices, wiring, control panels, power supplies, software, and all necessary accessories as necessary for a complete and operational system.

B. Basic Performance:
   1. Alarm, trouble, and supervisory signals from all initiating devices shall be connected to the control panel with an NFPA Style 4 or Style 7 Signaling Line Circuit. If wired in a Style 7 configuration, a single ground or open on the system Signaling Line Circuit (SLC) shall not cause system malfunction, loss of operating power, or the ability to report an alarm.
   2. Initiation Device Circuits (IDC) shall be connected to the monitor modules with NFPA Style B or Style D circuits.
   3. Indicating Appliance Circuits (IAC) shall be connected to the panel or control modules using NFPA Style Y or Style Z circuits.
   4. Digitized electronic signals shall employ check digits or multiple polling techniques.
   5. Alarm signals arriving at the control panel shall not be lost following a power failure (or outage).
   6. System shall interact with gymnasium sound system. Through the provision of relays connected to the speaker wiring, system shall silence the sound system upon initiation of general alarm.

7. System shall interact with the Access Control system. Through an interface with the Access Control system, the Access Control system shall unlock all exterior doors, permitting entry by fire department or first responding personnel upon initiation of general alarm.

1.03 QUALITY ASSURANCE

A. The system supplier shall have in-place a local support facility within 100 miles of the job site. This facility shall provide 24 hour service call handling, service personnel, spare parts inventory, and all necessary test equipment to troubleshoot, repair or replace any component within 12 hours of notification by the owner's representative.

1.04 SUBMITTALS

A. Forward submittal data and fire alarm floor plans and riser diagrams and additional data as required by the State Fire Marshal. As a minimum, submittals shall consist of:
   1. Data sheets of all products, including UL directory listings
   2. Wiring diagrams, including panel and device power and interconnection diagrams
   3. Panel layout, configurations, and terminations
   4. Bill of materials for all proposed devices and panels
   5. Sequence of operation in text form
   6. Point/room schedules for all devices
   7. Plans showing device lay-out, and all pertinent reflected ceiling plan information.

B. Manuals:
   1. Submit complete operating and maintenance manuals, (listing the manufacturer's name(s) and including technical data sheets), simultaneously with the shop drawings.
   2. Indicate internal wiring for each piece of equipment and the interconnections between the pieces of equipment in wiring diagrams.
   3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

C. Software:
   1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades, or changes. Response time of the technician to the site shall not exceed 12 hours. Provide all hardware, software, programming tools, and documentation necessary to modify the fire alarm system on site. Modification includes: addition and deletion of devices, circuits, zones, and changes to system operation, and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

D. Contractor shall provide all documents required by the State Fire Marshal to review. Documents shall include all calculations and data necessary. These documents shall be sent to the Architect for his forwarding to the State Fire Marshal. This Contractor shall pay all fees associated with the Fire Marshal submittal. No work shall be done until the submittal is approved and returned from the Fire Marshal.

1.05 GUARANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one year from the date of acceptance. The full cost of maintenance, labor, and materials required to correct any defect during this one year period shall be included.

1.06 APPLICABLE STANDARDS AND SPECIFICATIONS

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards adopted by the local Authority Having Jurisdiction (AHJ):
   1. NFPA 72 National Fire Alarm Code
   2. NFPA 101 Life Safety Code
   3. UL 268 Smoke Detectors for Fire Protective Signaling Systems
   4. UL 864 Control Units for Fire Protective Signaling Systems
   5. UL 268A Smoke Detectors for Duct Applications
   6. UL 521 Heat Detectors for Fire Protective Signaling Systems
   7. UL 464 Audible Signal Appliances
   8. UL 38 Manually Activated Signaling Boxes for Use With Fire-Protective Signaling Systems
   9. UL 346 Waterflow Indicators for Fire Protective Signaling Systems
   10. UL 1076 Signaling Devices for the Hearing Impaired
   11. UL 1971 Visual Indicating Appliances
   12. Parish and State Building Codes
   13. All requirements of the Authority Having Jurisdiction (AHJ)

1.07 APPROVALS

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
   1. UL: Underwriters Laboratories, Inc.
   2. FM Factory Mutual Systems

B. The fire alarm control panel shall meet UL Standard 864, (Control Units).

C. The system shall be listed by the national agencies as suitable for extinguishing release applications.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIAL, GENERAL

A. All equipment and components shall be new and the manufacturer's current model. The materials, appliances, equipment, and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.02 CONDUIT AND WIRE

A. Conduit

1. Conduit shall be in accordance with The National Electrical Code (NEC), local, and state requirements.
2. All wiring shall be installed in conduit above ceilings supported from structure, and within walls.
3. Cable must be separated from any open conductors of power or Class 1 circuits, and shall not be placed in any conduit, junction box, or raceway containing these conductors, as per NEC Article 760-29.
4. Wiring for 24-volt control, alarm indicating, emergency communication, and similar power-limited auxiliary functions, may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduits shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the control panel manufacturer.

B. Wire

1. All wiring shall be new, and shall meet all requirements as stated herein.
2. Wiring shall be in accordance with local, state, and national codes (e.g., NEC Article 760), these specifications and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63 mm) for indicating appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. Wiring used for the multiplex communication loop shall be twisted and shielded. The system shall permit use of IDC and IAC wiring in the same conduit with the communication loop.
5. All field wiring shall be supervised for open circuits, short circuits, and ground faults.

C. Terminal Boxes, Junction Boxes, and Cabinets: All boxes and cabinets shall be UL Listed for their use and purpose.

D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to electrical grounding system.

2.03 MAIN FIRE ALARM CONTROL PANEL

A. A listed control panel shall be used. Provide copies from the UL directory indicating equipment clearly.

B. Signaling Line Circuit (SLC)
1. The SLC Interface shall provide power to and communicate with up to 99 intelligent detectors (Ionization, Photoelectric, or Thermal) and 99 intelligent modules (monitor or control) for a system capacity of 198 devices. This shall be accomplished over a single SLC loop and shall be capable of NFPA 72 Style 4, Style 6, or Style 7 wiring. Provide loops as required with each loop no more than 80% utilized.
2. The Loop Interface Board (LIB) shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
3. The detector software shall meet NFPA 72, Chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
4. The detector software shall allow manual or automatic sensitivity adjustment.

B. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL Standard 864.

C. Field Programming
1. The system shall be programmable, configurable, and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
2. All programming may be accomplished through the standard control panel keypad.
3. All field defined programs shall be stored in non-volatile memory.
4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for programming changes.

5. Editing of the program shall not interfere with the normal operation of the control panel. If a fire condition is detected during a programming operation, the system shall exit programming and perform fire protection functions as programmed.
6. A special program check function shall be provided to detect common operator errors.
7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

D. Specific System Operations
1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad. Sensitivity range shall adjustment shall be as allowed by Underwriters Laboratories (UL).
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled for alarm verification. The Alarm Verification delay shall be programmable from 5 to 30 seconds. The FACP shall count the number of times each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
3. Point Disable: Any device in the system may be enabled or disabled through the system keypad.

2.04 SYSTEM COMPONENTS

A. Programmable Electronic Speakers
1. Speakers shall operate on 24 VDC nominal.
2. Speakers shall include field selectable power taps from 1/8 watt to 8 watts with listed sound output up to 96 dBA for speakers.
3. Faceplate shall be white.

B. Strobe Lights
1. All Strobe Lights (visual appliances) shall incorporate a Xenon flashtube enclosed in a Lexan lens. Strobes shall be the low current design and shall have zero inrush. The strobe intensity shall be rated per UL 1971. The candela strobes shall incorporate circuitry for synchronized strobe flash and shall be synchronized where required. The strobes shall not drift out of synchronization at any time during operation. If the sync module fails to operate (i.e., contacts remain closed), the strobes shall revert to a non-synchronized flash rate.
2. Strobe lights shall meet the requirements of the ADA and UL Standard 1971 and shall meet the following criteria:
   a. The maximum pulse duration shall be 2/10 of one second.
   b. The strobe intensity shall meet the requirements of UL 1971.
   c. The flash rate shall meet the requirements of UL 1971.
   d. The appliance shall be placed 80 inches (2,030 mm) above the highest floor level within the space, or 6 inches (152 mm) below the ceiling, whichever is the lower.
3. Faceplate shall be white.

C. Audible/Visual Combination Devices
1. Combination Audible/Visual devices shall incorporate a Xenon flashtube enclosed in a rugged Lexan lens with solid state circuitry. Strobe shall meet UL 1971 and produce a flash rate of one (1) flash per second minimum over the input voltage range. The strobe intensity shall be rated per UL 1971.

2. Speakers shall include field selectable power taps from 1/8 watt to 8 watts with listed sound output up to 96 dBA for speakers and 93 dBA for speaker strobes. All models shall have provisions for standard reverse polarity type supervision for strobe portion and IN/OUT field wiring using terminals that accept #12 to #18 AWG wiring. The speaker shall incorporate sealed back construction.
3. Faceplate shall be white.

D. Addressable Devices (General)
1. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches.
2. Addressable smoke and thermal detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. The flashing of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the detector base to connect an external remote alarm LED.

E. Addressable Detectors
1. Smoke detector sensitivity shall be set through the control panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
2. Using software in the control panel, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7. Detectors shall be ceiling-mounted and shall include a separate twist-lock base with tamper proof feature.
3. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
4. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
5. Photoelectric detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
6. Thermal detectors shall be intelligent addressable devices rated at 135°Fahrenheit (58°Celsius) and have a rate-of-rise element rated at 15°Fahrenheit (9.4°Celsius) per minute. The detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.

F. Addressable Pull Stations
1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be constructed of LEXAN with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
4. Stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches nor more than 48 inches above the finished floor.
5. Faceplate shall be white.

G. Addressable Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the control panel Signaling Line Circuits (SLCs).
2. The Monitor Module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone may be wired for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 x 1-1/4 x 1/2 inch. This version need not include Style D capability or an LED.

H. Addressable Control Module
1. For fan shutdown and other auxiliary control functions, the control module shall be set to operate as a Form-C dry contact relay.
2. The Control Module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module circuit may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal, or 2 amps of resistive signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements and to insure that 100% of all contacts can be energized at the same time.
4. The control module shall be addressed with decimal switches and shall store an internal identifying code to indicating its device type. An LED shall be provided that shall flash under normal conditions, indicating normal operation and communication with the control panel.
5. A magnetic test switch shall be provided to test the module without opening or shorting its field wiring.
6. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

I. Isolator Module
1. Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC. At least one isolator module shall be provided for each floor of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator module is operational and illuminate steadily to indicate that a short circuit condition has been detected.

J. Batteries
1. Batteries shall be 12 volt, Gel-Cell type (quantity as required). Submit calculations for approval.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids shall be required. Fluid level checks for refilling, spills, and leakage shall not be required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA 72, local, and state codes, as shown on the drawings, and as recommended by the equipment supplier.

B. All conduit, junction boxes, conduit supports, and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels, and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Fire alarm control panel and all power supplies shall be located in the electrical room #123. Voice evacuation module and remote annunciator shall be located in lobby #101 as shown on the drawings, flush-mounted.

3.02 TESTING

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.
1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the control panel.
3. Verify activation of all waterflow switches.
4. Open initiating device circuits and verify that the trouble signal activates.

5. Open and short signaling line circuits and verify that the trouble signal activates.
6. Open and short indicating appliance circuits and verify that trouble signal activates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tones at all alarm indicating devices.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.
10. Introduce each of the alarm conditions that the system is required to detect. Verify the proper receipt and the proper processing of the signal at the control panel and the correct activation of the control points.
11. When the system is equipped with optional features, consult the manufacturer's manual to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and the like.

3.03 FINAL INSPECTION

A. At the final inspection a factory trained representative of the Fire Alarm and the BAS equipment manufacturers shall demonstrate that the systems function properly in every respect.

3.04 INSTRUCTION

A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system, including program changes, operation, testing and troubleshooting shall be provided. Instruction period shall be coordinated through the Architect and shall be not less than four (4) hours in length.

B. Provide 2 sets of manuals upon completion and acceptance, along with one set of reproducible drawings, showing the as-built routing of all wiring for all devices.

END OF SECTION 16600

SECTION 16650

INTRUSION DETECTION SYSTEM

PART 1 GENERAL

1.01 REFERENCES

A. Underwriters Laboratories (UL):

1. UL 611 – Central Station Burglar-Alarm Units
2. UL 636 – Holdup Alarm Units and Systems
3. UL 684 – Local, Central Station, and Remote Station
4. UL 1076 – Proprietary Burglar-Alarm Units and Systems
5. UL 1610 – Central-Station Burglar-Alarm Units

B. Federal Communications Commission (FCC):

1. Code of Federal Regulations Title 47 - Part 15 – Radio Frequency Devices
2. Code of Federal Regulations Title 47 - Part 68 – Connection of Terminal Equipment to the Telephone Network

C. National Fire Protection Association (NFPA):

1. NFPA70 – National Electrical Code.
2. NFPA 72 – National Fire Protection Code

1.02 SYSTEM DESCRIPTION

A. The system shall be a Intrusion Detection system that includes the following capabilities:

1. Listed for UL Commercial Burglary.
2. Supports up to 32 zones.
3. Supports up to 150 users.
4. Supports commercial wireless devices.
5. Provides supervision of peripheral devices.
6. Supports up to 96 optional relay outputs.
7. Provides scheduling capability to allow for automated operations.
8. Supports up to eight (8) alphanumeric paging devices.
9. Supports status and alarm reporting, and conrol via Access Control System.
10. Supports alarm reporting via Internet.
11. Interfaces with automation software.

1.03 SUBMITTALS

A. Forward 6 copies of submittal data, floor plans, and riser diagrams and additional data as required for complete description of system installation. As a minimum, submittals shall consist of:

1. Data sheets of all products, including UL directory listings
2. Wiring diagrams, including panel and device power and interconnection diagrams
3. Panel layout, configurations, and terminations
4. Bill of materials for all proposed devices and panels
5. Sequence of operation in text form
6. Point/room schedules for all devices
7. Plans showing device lay-out, and all pertinent reflected ceiling plan information.

B. Manuals:

1. Submit complete operating and maintenance manuals, (listing the manufacturer's name(s) and including technical data sheets), simultaneously with the shop drawings.
2. Indicate internal wiring for each piece of equipment and the interconnections between the pieces of equipment in wiring diagrams.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

C. Software:

1. Provide the services of a factory trained and authorized technician to perform all system software installation, startup, and programming per user requirements. Provide all software licenses and backup copies of all software and programming to owner upon completion.

1.04 QUALITY ASSURANCE

The alarm manufacturer shall be certified as being compliant with ISO9001.

1.05 GUARANTY

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one year from the date of acceptance. The full cost of maintenance, labor, and materials required to correct any defect during this one year period shall be included.

PART 2 PRODUCTS

2.01 INTRUSION DETECTION SYSTEM COMPONENTS

A. Control Panel - The control panel shall be a UL commercial burglary control panel that supports up to 32 zones using basic hardwired, polling loop, and wireless zones. It shall also provide supervision of two (2) notification appliance output circuits (NAC), RF receivers, and relay modules. In addition, the control shall provide the ability to schedule time-driven events, and allow certain operations to be automated by pressing a single button. It shall be interfaced to allow disarming of system upon hardwire input from programmed output from the Access Control system.

1. Basic Hardwired Zones - The control shall provide eight (8) style-B hardwire zones with the following characteristics:
    a. EOLR supervision (optional for zones 3-8): Shall support N.O. or N.C. sensors (EOLR supervision required for UL installations).
    b. Zones/Points shall be individually assignable to one of eight (8) partitions.
    c. Individually assignable to Notification Appliance (NAC) outputs and/or auxiliary relays.
2. Optional Expansion Zones
    a. Polling Loop Expansion – The control shall support up to 24 additional hardwire zones using a built-in two-wire polling (multiplex) loop interface. The polling loop shall provide power and data to remote point modules, and constantly monitor the status of all zones on the loop.
    b. Wireless Expansion – The control shall support up to 128 wireless zones. Wireless zones shall have the following characteristics:
        1. Supervised by control panel for check-in signals (except certain non-supervised transmitters).
        2. Tamper-protection for supervised zones.
        3. Individually assignable to one of the partitions.
        4. Individually assignable to bell outputs and or auxiliary relays.
        5. Support wireless devices listed for Commercial Burglary using the 5881ENHC RF Receiver.
3. User Codes – The control shall accommodate 150 user codes. Certain characteristics must be assignable to each user code, as follows:
    a. Authority level (Master, Manager, or several other Operator levels). Each User Code (other than the installer code) shall be capable of being assigned the same or a different level of authority for each partition that it will operate.
    b. Opening/Closing central station reporting option.
    c. Specific partitions that the code can operate.
    d. Global arming capability (ability to arm all partitions the code has access to in one command).
4. Peripheral Devices – The control shall support up to 30 addressable ECP devices, which can be any combination of keypads, RF receivers, relay modules, annunciator modules, and interactive phone modules. Peripheral devices have the following characteristics:
    a. Each device set to an individual address according to the device's instructions.
    b. Each device enabled in system programming.
    c. Each device's address shall be supervised (via a programming option).
5. Keypad – The control shall accommodate up to 16 keypads or six (6) touch-screen (i.e.; advanced user interface) keypads. The keypads shall be capable of the following:
    a. Performing all system arming functions.
    b. Being assigned to any partition.

c. Providing four programmable single-button function keys, which can be used for:

1. Panic Functions –activated by wired and wireless keypads; reported separately by partition.
2. Keypad Macros –32 keypad macro commands per system (each macro is a series of keypad commands). Assignable to the A, B, C, and D keys by partition.

6. Optional Output Relays - A total of 96 relay outputs shall be accommodated using relay modules. Each relay module shall provide four (4) Form C (normally open and normally closed) relays for general-purpose use or two (2) Class-B, Style-Y supervised notification appliance circuit outputs. The relays shall be capable of being:

a. Programmed to activate in response to system events.
b. Programmed to activate using time intervals.
c. Activated manually using a relay command mode.
d. Assigned an alpha descriptor.
e. Used for Class B, Style-Y supervised bell outputs.

7. Notification Appliance Circuits (NAC) – The Control Panel shall internally provide two supervised NAC outputs for operating burglar alarm notification appliances. It shall also support additional supervised bell outputs when using relay modules. Each NAC output shall be rated at 10-14 VDC, 1.7 amp max power limited. Total alarm current draw when using two NAC outputs shall not exceed 2.3 amps for battery independent operation.

8. Auxiliary Relay – A built-in Form C relay shall be provided. The relay contacts shall be rated at 28 VAC/VDC, 2.8 amps maximum. The relay shall support:

a. Alarm activation.
b. Trouble/supervisory activation.
c. Battery saving feature.

9. Event Log – The System shall maintain a log of different event types (enabled in programming). The event log shall provide the following characteristics:

a. Stores up to 512 events.
b. Viewable at the keypad or through the use of software.
c. Printable on a serial printer.

10. Scheduling - Provides the following scheduling capabilities:

a. Open/close schedules (for control of arming/disarming and reporting).
b. Holiday schedules (allows different time windows for open/close schedules).
c. Timed events (for activation of relays, auto-bypassing and un-bypassing, auto-arming and disarming, etc.).
d. Access schedules (for limiting system access to users by time)
e. End User Output Programming Mode (provides 20 timers for relay control).
f. The system shall automatically adjust for daylight savings time.

11. Communication Features - Supports telephone capture and reporting to primary and secondary central station receivers.
12. Cross-Zoning Capability - Helps prevent false alarms by preventing a zone from going into alarm unless its cross-zone is also faulted within five (5) minutes.
13. Pager Interface – The Control Panel shall be capable of sending event information to an alphanumeric pager.
14. 24-Volt Power Supply – The Control Panel shall be compatible with a 24-Volt power supply module. The module shall supply two (2) 24 vdc, rectified, unfiltered outputs, which power:
    a. Alarm notification appliances, including but not limited to sirens horns, bells and strobes.
    b. Auxiliary devices capable of operating using full-wave rectified unfiltered voltage.
15. Exit Error False Alarm Prevention Feature – The System shall be capable of differentiating between an actual alarm and an alarm caused by leaving an entry/exit door open. If not subsequently disarmed, the control panel shall:
    a. Bypass the faulted E/E zone(s) and/or interior zones and arm the system.
    b. Generate an Exit Error report by user and by zone so the central station knows it was an exit alarm and who caused it.
16. Enhanced Walk-Test Mode – The Control Panel shall provide the installer with the following features:
    a. Automatic test of all integrated remote point module (RPM) devices, equipped with an automatic test feature.
    b. An event log shall be capable of logging the results of tested and untested zones.
    c. The ability to report the result of tested and untested zones to the central station.
17. Programming - The Control shall be capable of being programmed locally or remotely.
18. Automation Software - The Control shall be capable of interfacing with automation software via an RS232 input on a single partition.
19. Provide status and alarm indication output to Access Control System for monitoring by Campus Police via Access control system network. Include all interface devices, wiring, and connections for fully functional monitoring.

2.02 ENVIRONMENTAL CONDITIONS

A. Environmental Conditions – The System shall be designed to meet the following environmental conditions.
    1. Storage Temperature – The system shall be designed for a storage temperature of -10° C to 70°C.
    2. Operating Temperature - The system shall be designed for an operating temperature of 0° C to 50°C (32° F to 120°F).

3. Humidity - The system shall be designed for normal operation in an 85% relative humidity environment.
4. Electromagnetic Interference – The system shall meet or exceed the requirements of FCC Part 15, Class B devices, FCC Part 68, IEC EMC directive.

2.03 MOTION DETECTOR

A. The motion detector shall be dual technology, microwave, passive infrared, with adjustable sensitivity and range.

2.05 MAGNETIC CONTACTS

A. Magnetic contacts shall be flush mount, with wide gap capability.

2.03 ALARM HORN

A. Alarm horn shall be weatherproof, and installed in a tamperproof metal enclosure, with alarm contacts on enclosure.

2.04 KEYPAD

A. Keypad shall be surface mounted with the following minimum features:

1. Provide full programming capability for the security system.
2. Programmable up to 96 users.
3. Provide for zone by-pass.
4. Include panic alarm initiation and silent alarm initiation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Submission of a proposal confirms that the Contract Documents and site conditions are accepted without qualifications unless exceptions are specifically noted.

B. The site shall be visited on a regular basis to appraise ongoing progress of other trades and contracts, make allowances for all ongoing work, and coordinate the requirements of this contract in a timely manner.

3.02 INSTALLATION

A. The System shall be installed and tested in accordance with the Manufacturer's Installation instructions. The following conditions are applicable:

1. Interfaces shall be coordinated with the Owner's representative, where appropriate.
2. All necessary backboxes, pullboxes, connectors, supports, conduit, cable, and wire shall be furnished and installed to provide a complete and reliable System installation. Exact location of all boxes, conduit, and wiring runs shall be presented to the Owner for approval in advance of any installation.

3. All wiring shall be installed in minimum ½" conduit, cable, installed parallel and square with building lines. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered and tied up to create an orderly installation.

3.03 TESTING AND CERTIFICATION

A. The Contractor shall demonstrate the functionality of the System upon completion of installation, documenting the result of all tests and providing these results to the Owner. The System shall be tested in accordance with the following:

1. The Contractor shall conduct a complete inspection and test of all installed equipment. This includes testing and verifying connection to equipment of other Divisions.

2. The Contractor shall provide staff to test all devices and all operational features of the System for witness by the Owner's representative and the Authority having jurisdiction. The Contractor shall provide two-way radio communications to assist in the testing. All testing must be witnessed by the owner's representative, prior to acceptance.

3. The testing and certification shall take place as follows:

   a. System shall be tested in conjunction with the manufacturer's representative.
   b. All deficiencies noted in the above test shall be corrected.
   c. Test results shall be submitted to the consultant or owner's representative.
   d. System test witnessed by owner's representative and correction of any deficiencies noted.
   e. The owner's representative shall accept the System.
   f. System test shall be witnessed by the Authority having Jurisdiction, and any deficiencies that are noted shall be corrected.

4. A letter of certification shall be provided to indicate that the tests have been performed and all devices are operational.

END OF SECTION 16650

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SECTION 16670

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Access Control and Monitoring System (ACMS) as shown on the drawings and as described herein. Drawings are diagrammatic only.

B. All labor, material, equipment and software not specifically referred to herein or on the plans that are required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

D. Equipment and materials shall be new and shall be listed by Underwriters Laboratories for the purpose for which they are being used, and for the location where installed. All material of similar use shall be of the same manufacturer.

E. Substitutions to materials listed on the drawings and specifications with manufacturer and model number shall be prior approved in accordance with the bid requirements listed in the general and supplementary conditions of the specifications. Where no manufacturer or model number is listed, materials used shall meet the requirements of the drawings and specifications, and shall be listed for the use and installation intended.

1.2 SYSTEM DESCRIPTION

A. The entire Access Control and Monitoring System (ACMS) shall be comprised of a stand-alone security controller, expansion modules, badge readers, badging station, door sensors, enclosures, power supplies, backup batteries, and all devices required for monitoring, controlling, and badging as specified herein.

B. Access to the system, either locally within building, or remotely from a central site or sites, shall be accomplished through standard Web browsers via the Internet and/or local area network.

C. The ACMS shall provide automated alarming software capable of sending messages to e-mail compatible cellular telephones and pagers via the owner's e-mail service. The e-mail alarm paging system shall be able to segregate users, time schedules, and equipment, and be capable of being programmed by the owner.

D. All configuration of the ACMS may be done via a thin client web browser. No proprietary

configuration software shall be required for system programming or initial setup. ACMS systems that require proprietary configuration software are not acceptable.

E. The contractor shall provide the appropriate quantity of legal copies of all software tools, configuration tools, management tools, and utilities used during system commissioning and installation. All tools shall be generally available in the market. No closed and/or unavailable tools will be permitted. Contractor shall convey all software tools and their legal licenses at project close out.

1.3 SUBMITTAL

A. Shop drawings of the components and devices for the entire ACMS shall be submitted as required in the general conditions, and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, modules, readers, monitoring devices, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all wiring shall be shown on the shop drawings.

B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media, and protocol.

1. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The total point count shall be no more than 80% of the defined limit in order to provide future system expansion with minimal infrastructure modifications.

C. Submittal shall also include a complete point list of all points to be connected to the ACMS.

D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.

E. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk.

1.4 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

ACMS	Access Control and Monitoring System
GUI	Graphical User Interface

WBI	Web Browser Interface
LAN	Local Area Network
WAN	Wide Area Network
PICS	Product Interoperability Compliance Statement
.CSV	Comma Separated Value file format
.PDF	Portable Data File format

1.5 DIVISION OF WORK

A. The Division 16 contractor shall be responsible for the Security Controller, software and programming of the Security Controller, development of all graphical screens, initial set-up of schedules, logs and alarms, and connection of the Security Controller to the local or wide area network.

B. The Division 16 contractor shall be responsible for assuring that the ACMS functions do not interfere with safety systems in the facility including, but not limited to, Fire Alarm/Life Safety systems, elevator control systems, and evacuation systems.

C. The Division 16 contractor shall b responsible for integration between ACMS and the Fire Detection system and Intrusion Detections system. Systems shall interface as necessary to disarm the Intrusion Detection system upon first entry swipe into the facility for specific users, and to unlock all access control doors upon initiation of the Fire Detection system..

D. Data entry for personnel and badge records, other than that required for system check out, shall be the responsibility of the Owner.

1.6 SOFTWARE LICENSE AGREEMENT

A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the Security Controller and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the owner.

C. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all

configuration and programming that is generated for a given project and /or configured for use within Niagara AX Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and all connected routers and devices.

1.7 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.8 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

PART 2 - MATERIALS

2.1 GENERAL

A. The Access Control System (ACMS) shall be comprised of a stand-alone controller, network devices, proximity card readers, request-to-exit devices, monitoring devices, enclosures, power supplies, backup batteries, and other devices as specified herein.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall ACMS.

2.2 NETWORK ACCESS

A. Provide remote access via the local area network provided in the facility. ACMS shall be equipped to interconnect to a 1000 Megabit/sec Ethernet network. Remote access shall be password protected, and provide full capability to control, program , and monitor the system.

2.3 SECURITY CONTROLLER

A. The Security Controller shall provide the interface capability between the LAN or WAN and the field control devices, and control functions over the control devices connected to the Security Controller. It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Alarm monitoring and routing
4. Time synchronization
5. Historical data collection
6. Access control functions

B. The Security Controller shall provide the following hardware features as a minimum:

1. One Ethernet Port – 100/1000 Mbps
2. One RS-232 port
3. One RS-485 port
4. Battery Backup
5. Flash memory for long term data backup
6. The Security Controller must be capable of operation over a temperature range of 32 to 122°F
7. The Security Controller must be capable of operation over a humidity range of 5 to 95% RH, non-condensing
8. Interface for (2) 12 VDC powered Wiegand style card readers, keypads, or reader/keypad combinations.
9. Monitor (6) Supervised Inputs and (2) Digital inputs
10. Provide (4) SPDT Relay Outputs

C. The Security Controller shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.

D. The Security Controller shall store all access control information and historical data in controller resident memory. The controller shall be selected so as to utilize no more than 80% of the controller's current capacity to allow for future expansion.

E. The Security Controller shall provide the following access control functions:

1. Time and Attendance. Badge transactions on designated badge readers shall be marked with a date and time for arrival and departure. This information shall be available via a report that may be exported from the ACMS to a .CSV or .PDF format.

2. Access Zones. This function allows control and monitoring of personnel entering and exiting a specific area. Anti-passback, supervisor presence, schedules, and personnel count shall be available for use in controlling the access zone. System users with the necessary access rights shall be able to override or reset occupancy levels or personnel that are counted as occupying the access zone.

3. Access Rights. This function allows assignment of specific access privileges to badge holders and system users. Access rights shall allow badge holders to access specific areas during specific times as defined by a time schedule.

4. Manual control. Provide manual access control as specified on the drawings, and utilizing physical control stations located at the reception desk and the kitchen.

5. Interface with Intrusion Detection System. This function allows individual user accounts to disarm intrusion detection system upon first entry swipe to facility.

6. Intrusion Zones. The function allows set-up of a defined area for monitoring and alarming by allowing multiple sensing points to be combined into a logical group. Intrusion zones shall be armed or disarmed using a schedule, badge reader, keypad, badge reader/keypad combination, or manual override.

7. Tenant Segregation. This function allows the system to be partitioned for use by multiple entities that utilize the same ACMS. Each tenant shall have the ability to fully configure the system as it applies to his particular use without affecting another tenant.

8. System Users. System users shall be configurable to allow differing levels and areas of system access. Users may be defined by tenant assignment, graphic start page, and user level.
   User levels shall include:
   a. Administrator. The administrator shall have full system privileges including controller setup and configuration, graphic creation, report setup and generation, badge programming, and set-up for other system users.
   b. Maintenance. The maintenance user has full access to report, controller setup, graphic creation, and adding and editing user information for users and personnel assigned to the same tenant.
   c. Badge Operator. The badge operator may view and customize reports, and edit access rights and badge information for persons assigned to the same tenant. The badge operator does not have the right to acknowledge alarms.
   d. Operator. The primary role of the operator is to monitor and acknowledge alarms using the alarm console. The operator has read-only access to personnel records.

9. Personnel Records. The ACMS shall allow manual entry of personnel records and importing of personnel records from the existing campus database. Multiple badges may be assigned to each personnel record.

10. Badge Data Entry. The ACMS shall allow badge records to be programmed individually, in batches, enrolled (scanned and automatically programmed) at a designated badge reader, or imported from a .CSV file. Badge records shall have programmable commencement and expiration dates and may be designated as disabled, active, or lost.

11. Programmable Wiegand data format. The Security Controller shall be pre-configured with commonly used Wiegand data formats for badges and allow system users to configure custom Wiegand data formats.

12. Programmable Keypad Data formats. The Security Controller shall be pre-configured with commonly used keypad data formats including, but not limited to, HID5355 and GE T-525 formats.

13. Duress Alarms. The system shall be programmable to allow personnel using the keypad for access, to enter a number offset by a programmable value from their PIN

number to initiate a duress alarm. The location shall appear to access normally, but an alarm shall be generated to notify the system operators that an access occurred under duress.

14. Schedules. The Security Controller shall provide a scheduling interface that uses standard calendar functions and scheduling features including standard time programs, special event programming, and holiday scheduling. Scheduling shall be performed via a GUI that employs sliders and point-and-click programming. Schedules may be used to control access rights, lock/unlock doors, arm/disarm intrusion zones, disable alarms, and enable/disable remote alarm notification.

15. Reports. The following reports shall be pre-configured and available for use. The system user shall be able to modify these reports to include the desired information and sort the report by any field included in the report by using point-and-click selection. All report records shall be time-stamped. All reports may be exported to a .CSV or .PDF format.

    a. Access History Report. The access history report displays a table of all access activity.
    b. Audit History Report. This report displays a table of all log entries and system changes by system users.
    c. Log History Report. This report contains system application messages and the name of the log that contains detailed information for the event.
    d. Alarm Activity Report. This report displays a table of alarm records.
    e. Intrusion History Report. This report contains time-stamped information describing arming and disarming of intrusion zones and intrusion alarms.
    f. Attendance History Report. This report contains transactions for persons using badge readers as being used for time and attendance. Records may be manually inserted into the report to allow for editing the attendance record.
    g. Hardware Reports. The hardware report shall list the current status of all connected ACMS hardware including card readers, expansion modules, inputs, outputs, and BACnet points.
    h. Doors Report. This report lists all system defined doors and the current status of each.

F. Event Alarm Notification and actions

1. The Security Controller shall provide alarm recognition, storage; routing, management, and analysis.

2. The Security Controller shall be able to route any alarm condition to any defined user location whether connected to a local network, or remote via wide-area network.

3. Alarms shall be prioritized as being:

    a. High
    b. Medium
    c. Low

d. Off / Disabled

4. Alarm generation shall be selectable for annunciation type and acknowledgement requirements:
   a. Enable/Disable Alarm indicator
   b. Require Notes on Alarm Acknowledgement

5. Alarms shall display the following states:
   a. In alarm – point is currently in alarm and has not been acknowledged
   b. Acknowledged alarm – point is currently in alarm and has been acknowledged
   c. Return to normal – point has returned to normal, but has not been acknowledged
   d. Acknowledged normal alarm – point has returned to normal and has been acknowledged

6. The following types of security alarms shall be generated:
   a. Access Event Alarms
      1. Door Forced
      2. Door Held Open
      3. Badge Does Not Exist
      4. Badge is Lost
      5. Badge is Disabled
      6. No Active Schedule
      7. No Access Right
      8. Granted But Not Used
      9. Invalid Pin Number
      10. Anti Passback Violation
      11. Duress Alarm
      12. Access Zone Disabled
      13. Access Zone Occupancy Violation
      14. Access Zone Supervisor Required
      15. Intrusion Zone Armed from intrusion detection system
      16. Intrusion Zone Disarmed from intrusion detection system
      17. Intrusion Zone Arming Failed from intrusion detection system
      18. Intrusion Zone Alarm from intrusion detection system
   b. Power Failure
   c. Communications Alarm
   d. Open Circuit Supervision
   e. Short Circuit Supervision

G. Each alarm may have operator instructions assigned to it.

H. Controller and network failures shall be treated as alarms and annunciated.

I. Alarms shall be annunciated in any of the following manners as defined by the user:

1. Screen message text at central monitoring point on campus network
2. Email of the complete alarm message to multiple recipients via the owner's e-mail service. Provide the ability to route and email alarms based on:
   a. Day of week
   b. Time of day
   c. Recipient
3. Pagers via paging services that initiate a page on receipt of email message via the owner's e-mail service
4. Graphic with flashing alarm object(s)

J. The following shall be recorded by the Security Controller for each alarm (at a minimum):

1. Time and date
2. Location (building, floor, zone, office number, etc.)
3. Credential (if used)
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

L. Provide a "query" feature to allow review of specific alarms by user defined parameters.

2.4 DATA COLLECTION AND STORAGE

A. The Security Controller shall have the ability to collect and store hardware and software configuration information, card holder information, graphics, personnel records, access records, and historical data.

B. All log data shall be stored in a relational database in the Security Controller and shall be accessible from a standard Web browser.

C. All log data shall be available to the user in the following data formats:

1. .PDF
2. .CSV

D. The Security Controller shall have the ability to archive its data either locally (to itself), or remotely to a server on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day
2. Archive on user-defined number of data stores in the log (buffer size)
3. Archive when log has reached it's user-defined capacity of data stores
4. Provide ability to clear logs once archived

2.5 DATABASE BACKUP AND STORAGE

A. The Security Controller shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and the most recently saved database shall be stored in the Security Controller. The age of the most recently saved database is dependent on the user-defined database save interval.

2.6 OTHER ACCESS CONTROL SYSTEM HARDWARE

A. Proximity Card readers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
a. HID Thinline II Wiegand
2. ADA compliant where required
3. Tamper resistant
4. Weather resistant
5. HID™ compatible
6. Wiegand format
7. Proximity
8. Powered by 12 VDC
9. Operational between -25° F to 145° F (-31° C to 63° C), and 0-95% relative humidity (non-condensing).

B. Proximity Cards and Programming

1. Provide 200 proximity cards, no photo I.D., and all associated hardware for initiation and user data entry and account setup.

C. Electronic Door Hardware

1. System shall be capable of monitoring and controlling electronic door hardware provided by the door hardware contractor, as called for in other sections of the specifications, and where door power supply/controllers are not provided.
2. System shall fully interconnect with door controllers provided by the door hardware contractor, as called for in other sections of the specifications.

D. Vehicle Gate Operators

1. System shall be capable of monitoring and controlling vehicle gate operators, as provided in other sections of the specifications. Gate operators shall be controlled as follows:
a. Locally using RF remote controllers provided with the gate operators
b. Manual control stations connected to the access control system
c. 7-day programmable time schedule by the access control system

E. Door Position Sensors

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
a. Honeywell
b. Schlage

c. Securitron

2. Recessed as specified for each location
3. SPDT contact configuration
4. Operate over normal door opening tolerances

F. Power Supplies / Battery Chargers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Altronix
   b. Honeywell
   c. Schlage
   d. Securitron
2. UL Listed for Access Control (UL294)
3. Provide 12-15 VDC current limited output.
4. Provide charging for 12 VDC sealed lead-acid batteries.
5. Provide automatic switchover from Primary to Battery power without voltage drop.
6. Provide dry contacts for indication of Low Battery and AC Power Failure.
7. Be selected to provide 120% current capacity.

G. Badging Station

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

H. Enclosures

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified. If the selected Security Controller requires a specific enclosure to maintain listings and approvals, use the enclosure specified by the Security Controller manufacturer.
   a. Honeywell
   b. Schlage
   c. Securitron
2. Provide locking doors. All keys for door locks are to be given to the Owner at job completion.
3. Provide tamper indication via a door position switch.
4. Clearly labeled with manufacturer's name and contents.
5. Provide grounding lugs for connection to earth ground and EMI shielding.

I. Batteries

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified. If the selected Security Controller requires a specific enclosure to maintain listings and approvals, use the enclosure specified by the Security Controller manufacturer.

a. Honeywell
b. PowerSonic

2. Shall be housed in a sealed impact-resistant case
3. Shall be securely mounted in an enclosure
4. Shall be sized to provide 8 hours backup at specified voltage and 120% rated current draw to all connected devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

B. Drawings of the ACMS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.

C. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.

D. Provide initial user account setup, as specified by owner, for a maximum of 20 users.

3.2 WIRING

A. All electrical control wiring and power wiring to the Security Controller, computers and network components, and all components monitored and controlled by the ACMS shall be the responsibility of the this contractor.

B. All communication and control wiring shall conform to specifications as provided by the manufacturer of the ACMS.

C. All wiring shall be in accordance with the Division 16 specifications, the National Electrical Code and any applicable local codes. All ACMS wiring shall be installed in EMT conduit, minimum size 3/4", installed in accordance with the Division 16 specifications. Conduit routed into door frames shall be minimum size 1/2".

3.3 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

3.4 WARRANTY ACCESS

A. The Owner shall grant to this contractor, reasonable access to the ACMS during the warranty period.

B. The owner shall allow the contractor to access the ACMS and FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary testing and de-bugging, and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. This contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the ACMS operation.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative.

D. System Acceptance: Satisfactory completion is when this contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the ACMS hardware and software has been established, this contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. This contractor shall provide 12 hours of instruction to the owner's designated personnel on the operation of the ACMS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, access control functions, commands, advisories, and appropriate operator intervention required in responding to the System's operation.

C. The training shall be in three sessions as follows:

1. Initial Training: 1/2 day session (4 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior

to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.

2. First Follow-Up Training: 1/2 day (4 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
3. Warranty Follow Up: 1/2 day (4 hours total), to be scheduled at the request of the owner during the one year warranty period. These sessions shall cover topics as requested by the owner such as; how to add additional points, how to query and modify reports, graphic screen generation or modification of floor plans.

END OF SECTION 16670

SECTION 16750

PA/INTERCOM SYSTEM

PART 1 – GENERAL

1.2 GENERAL REQUIREMENTS

A. The Contractor shall furnish and install all equipment including, but not limited to, outlet boxes, conduit (with pull strings), wiring, telephones, annunciators, speakers, and microphones as shown on the plans, and all other equipment necessary to provide a complete and operating system.

B. Equipment supplied by SimplexGrinnell Co. shall be considered as meeting these specifications and as the base bid. Any prior approval of an alternate system does not exempt the supplier from meeting the intent of these specifications. If the alternate system fails to provide all the requirements specified in this document, the Contractor shall be responsible for all costs associated with the removal and replacement of said equipment.

C. The Communication system shall provide distribution of intercom, overhead paging, classroom stations, emergency paging, class change time tones, emergency tone and program material.

D. System shall also include a standalone sound system for the gymnasium, consisting of permanently installed speakers, wiring, and speaker input jacks, as well as a mobile cart containing mixer, amplifier, microphones, CD/DVD player as specified herein.

1.3 SUBMITTALS

A. Data sheets shall be provided on all equipment being provided.

B. Internal control cabinet drawings showing internal block diagram connections shall be provided.

C. Wiring diagrams showing typical field wiring connections shall be provided.

D. FCC registration number shall be provided.

1.4 QUALIFICATIONS

A. The Contractor shall be from an established and locally run business which has been operating in the area for a minimum of five years.

B. The Contractor shall show evidence that he maintains a service organization and parts inventory to adequately support the supplied equipment.

1.5 QUALITY ASSURANCE

A. The Contractor shall currently maintain a locally run business for a minimum of five years and shall be an authorized distributor of the supplied equipment with full warranty privileges.

B. The Contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the equipment manufacturer to maintain and service the equipment being supplied. This facility shall be available for inspection by the engineer.

C. The supplying Contractor shall have attended the manufacturer's installation and service school.

D. The Contractor shall furnish manufacturer's manuals of the completed system including individual specification sheets, schematics, inter-panel and intra-panel wiring diagrams. In addition, all information necessary for the proper operation of the system shall be included.

E. As built drawings that include any changes to wiring, wiring designations, junction box labeling and any other pertinent information shall be supplied upon completion of project.

1.6 IN SERVICE TRAINING

A. The Contractor shall furnish a minimum of four hours of in service training with the system. These sessions shall be broken into segments that will facilitate the training of individuals in operating station equipment, administrative devices, user programming functions, and program distribution equipment. Operating manuals and users guides shall be provided at the time of the training.

1.7 WIRING

A. System wiring shall be in accordance with good engineering practices as established by the EIA and NEC. Wiring shall meet all established state and local electrical codes. All wiring shall test free from grounds and shorts.

PART 2 – PRODUCTS

2.0 The installation shall include a comprehensive programmable microprocessor based communications system consisting of a central switching exchange capable of handling up to 50 remote stations.

2.1 All programmable functions shall be stored in non-volatile memory to prevent loss during a power failure condition.

2.2 System shall have battery back up and charger specifically designed for use with system power supplies. Systems that use an uninterruptible AC power supply (UPS) must be pre-approved.

2.3 The central switch shall utilize standard dual tone multi-frequency type decoding (DTMF) for conformance with standard telephone practices.

2.4 The central switch shall provide a LAN/WAN connection via a standard Ethernet RJ-45 jack to provide on or off site programming and or diagnostics. It shall be possible for the user with a computer connected to the LAN/WAN to access and change all system parameters as necessary and to save complete system architecture on its storage medium. It shall also be possible to run diagnostic software to isolate and correct faults in the system. These capabilities must also be provided thru a standard RS232 port for local access.

2.5 The system shall be provided with four (4) multifunction ports for connection of administrative phones, any loop start trunk (LST) port of a KEY or PBX telephone system. All communication between administrative phones shall be non-blocking. Provide a minimum of one LST port interface as part of this basic specification.

2.6 The system shall have the ability to be connected to a 10/100 switched, multicast enabled network. This connection shall be via a standard Ethernet RJ-45 jack and shall provide all system functionality across the LAN/WAN to remote cabinets eliminating the need for individual peripherals to be wired back to the main switch. All devices connected to these remote shelves shall provide the same capabilities as those connected directly to the MDF.

2.7 Provide a one (1) watt amplifier circuit for each remote station to allow absolute flexibility for simultaneous paging, program distribution and time tone schedules. Equipment requiring a single power amp for these functions shall size such an amp as to deliver a minimum of (1.5) watt per station to compensate for inherent transformer losses. Additional power will be required for hallway speakers, outside horns and common areas.

2.8 Facilities for a directly connected RS232 printer output to create a log of system activity. System activity logging and reporting shall also be delivered through the RJ-45 jack to be distributed across a LAN.

2.9 Capabilities of zoning incoming calls from any staff station location to any of four (4) multifunction ports.

2.10 Four (4) telephonic links between DTMF telephone locations.

2.11 Eight (8) unrestricted audio paths for private communication between administrative phones, administrative phones and staff stations, program distribution or time tone distribution and paging. The system shall be able to perform multiple pages to different zones, class change tones and music distribution simultaneously. A minimum of four (4) simultaneous live voice pages while leaving four (4) additional paths for music and/or class change tones can be supported. Systems that cannot support a minimum of three (3) live pages and one (1) program distribution channel simultaneously shall not be accepted.

2.12 Provide one (1) direct dialing, two-way voice amplified intercom link with automatic gain control for every twenty-four stations allowing multiple open voice conversations simultaneously.

2.13 Provide eight (8) separate time-tone schedules with a minimum of 1024 events. Individual events of each schedule shall be capable of sounding one of nine user defined tone types or custom messages from a customer programmed voice chip. These schedules shall be capable of running individually or simultaneously.

2.14 Eight (8) internal relays which can be controlled manually from any administrative phone or controlled automatically via an optional integral Master Time Control Center.

2.15 Program distribution of three (3) audio program sources simultaneously to any one or group of staff stations. Typical audio program sources can include:

2.15.1 AM/FM Digital Tuner
2.15.2 Cassette Deck
2.15.3 CD Player

2.15.4 AM/FM CD Combination Player

2.16 Seventy-Two (72) paging zones and a dial on the fly group with two (2) priority levels of all call capability. Paging into any one zone shall not interrupt any program(s) previously distributed. If the areas receiving program are part of the page zone the program shall be interrupted during the page and returned automatically when the page is completed. Each group shall be able to have a custom name assigned to it simplifying programming of multiple groups of speakers.

2.17 Nine (9) built in software definable signaling tones. A voice chip with the option for a male or female voice, which shall be used to store custom messages, labels for rooms and custom emergency tones. Voice announcements shall be automatically or manually at any time.

2.18 Two (2), three (3) or four (4) digit programmable architectural room numbers for administrative and staff station locations.

2.19 The system shall be provided with voice-synthesized call-in, which provides any administrative telephone audible annunciation of the calling parties location and architectural room number.

2.20 Enhanced Caller I.D. information for use with all administrative phones. It shall be possible to deliver industry standard enhanced Caller I.D. information to any third party phone system providing seamless annunciation of room numbers and operation between systems.

2.21 Discriminating ringing to distinguish different levels of incoming calls.

2.22 Selective pre announce tones: a) Single chime-Page b) Dual chime-Intercom call c) or a custom tone.

2.23 Call confirmation tone at the intercom speaker location when a call is placed. This tone verifies that the call has been placed into the system queue. A second confirmation tone shall be activated if the call is upgraded to an emergency call (See 2.31.3). Equipment, which does not notify the caller that the system has accepted the upgraded call, shall not be accepted.

2.24 Unanswered emergency calls shall, after a user-determined time, have their architectural room number automatically announced over any one or group of speakers. This automatic page shall notify nearby staff of an unanswered emergency condition and ensure staff notification of the emergency situation.

2.25 The administrative telephone shall be a standard DTMF set. Any system requiring a "smart" or proprietary type instrument shall not be acceptable. The administrative phone shall be equipped with a 4 x 20 LCD display for visual display of incoming calls. The following features shall be provided by the administrative telephone:

2.25.1 Three levels of system access:

a. Level 1 - Dialing of any administrative or speaker station, all call, emergency all call, zone paging, scroll/erase call waiting queue, transfer and conference.
b. Level 2 - Same as Level 1 with select and distribute program capabilities, set/reset alarm and relay functions.
c. Level 3 - Same as Level 2 plus the capability to bump or join a conversation in progress and to access system set-up menu for all programming features.

2.25.2 Speaker and microphone for hands free communication. Administrative phones requiring a push to talk switch shall not be accepted.

2.25.3 Multiple touch programmable function buttons for frequently dialed functions, page groups, bell schedules, program distribution, etc.

2.25.4 Emergency programmable buttons for alert and evacuation tones.

2.25.5 Mute function for privacy.

2.25.6 Selective monitoring of program sources being distributed to staff locations.

2.25.7 Facilities to transfer or hold calls.

2.25.8 Auto redial of the previous two numbers dialed.

2.25.9 Adjustable ringer volume.

2.25.10 Hands free speaker volume control.

2.26 An operator's display shall be provided at each designated administrative phone. This 4 x 20 LCD display shall continually show time, day, date and current operating time schedule(s) unless it is in the programming mode. In addition, it shall show up to three (3) incoming calls (the fourth line shows how many additional calls are in the queue). Programming menus, time schedules and complete system architecture shall also be displayed when in the programming mode.

2.27 A Windows® based administrative software package to allow computer based access to all paging functions, including instantaneous distribution of pre recorded emergency messages shall be provided. The package shall utilize a point and click operation to allow music distribution to individual zones, manage any system controlled remote devices, manipulate schedules and paging groups. The software package shall be client-based to ensure that any programming changes are duplicated (backed up) in the computer for download to other 5120 systems connected to the enterprise. Equipment not providing a computer-based operational user interface to the paging system or using browser-based programming shall not be acceptable.

2.28 A Windows™ based programming software package to allow computer based configuration of the entire system shall be available. The software package shall be client-based to ensure that any programming changes are duplicated (backed up) in the computer for download to other 5120 systems connected to the enterprise. Equipment not providing a computer-based operational user interface to the paging system or using browser-based programming will not be acceptable.

2.29 Intercom stations shall be Talkback Door Plate Speaker, Model V-1072A-ST, shall be a weather resistant speaker assembly for use with hand free talkback control units. It shall have a voice coil rating of 45 Ohms. The faceplate assembly shall be constructed of rugged stainless steel. It shall have a call button for signaling. The unit shall be compatible with 2-gang 4" x 4" electrical boxes. Dimensions shall be 4.5" (11.43 cm) H x 4.5" (11.43 cm) W x

1.3" (3.3 cm) D and the unit shall weigh .55 lb. (.25 kg).

2.30 The hallway and other multi speaker areas shall use speakers with an 8" dual cone design with a minimum frequency response of 30Hz-18kHz. It shall have a minimum voice coil diameter of ¾" and be capable of handling 10 watts of program power. Multi purpose area speakers shall incorporate self-amplified speakers in order to use structured cable throughout the system. Any system requiring 25/70 volt speaker assemblies with line matching transformers will use a transformer of such quality that a minimum frequency response of 60Hz-12kHz will be provided.

2.33.1 Multi purpose area speakers shall be:

Ceiling mounted single assembly type, designed to fit into an industry standard drop ceiling. Ceiling speakers requiring assembly to separate back boxes will not be acceptable.

Ceiling mounted with white round metal baffle designed to mount in separate back box. Back box shall be designed to mount in industry standard drop ceiling.

2.31 Weatherproof outside paging loudspeakers shall have a minimum power rating of five (5) watts. The speaker shall have a minimum frequency response of 275-14kHz and a dispersion angle of 120 x 60 degrees. It shall be surface mounted, capable of delivering five (5) or fifteen (15) and be rated for outside use, as needed for proper coverage of play area.

2.32 Provisions for the automatic distribution of paging announcements from a remote desk mounted microphone. Keying the microphone shall automatically mute all other audio sources and transmit the microphone signal to all rooms or specific groups of rooms as programmed into the system software.

2.33 Provide Program Monitor Assembly to preview audio material prior to distribution. Provide a roof top antenna to ensure proper reception on the FM band. Provide appropriate wall or desk rack mounting of this device as shown on drawings.

2.34 All cable shall be listed for the intended purpose. Use CAT 3/5/5e/6, 24AWG, U.L. Listed cable. Home run all station wiring in individually jacketed cables. Number of pairs within the cable may vary due to specific field conditions.

2.35 All interior staff station wiring shall be in accordance with current new construction wiring guidelines published by the manufacturer, including staff speaker and call switch.

2.36 All interior Administrative phone(s) shall be wired in accordance with current new construction wiring guidelines published by the manufacturer.

2.37 All operator displays shall be connected to the system in accordance with current new construction wiring guidelines published by the manufacturer.

2.38 All amplified speaker circuits shall be connected using two (2) twisted pairs. One pair for line level audio and one pair for 24 VDC power.

2.39 All constant voltage speaker circuits shall be connected using a separate twisted shielded pair.

2.40 Transient suppression shall be required on all wiring leaving the building.

2.41 All cables run in underground conduits shall be suited for wet locations.

2.42 Gymnasium Sound System

A. Speakers: Octasound SP820A, omni-directional, 200W RMS, 400W peak, or approved equal.

B. Speaker Jacks: STX chassis connectors, metal body, soldered connection.

C. Speaker Cable: STX cable connectors, metal body, #12 AWG stranded copper hard usage cable, minimum 12 feet. Provide 2 sets, 1 primary for left and right cahnnels, and 1 spare set.

D. Mixer: Crown 28M or approved equal.

E. CD Player: Tascam CD-200i with ipod docking station, or approved equal.

F. Amplifier: Crown XTi 1000 or approved equal, maximum 275W per channel.

G. Wired cardiod microphone: Bogen HDU150 or approved equal, cardiod pickup pattern, quantity 4.

H. Wired omni microphone: Bogen HDO100 or approved equal, omni-direction pickup pattern, quantity 4.

I. Wired desktop microphone: Bogen MBS1000A or approved equal, cardiod pickup pattern, quantity 2.

J. Wireless microphone: Bogen UDMS800HH handheld microphone and receiver, or approved equal, quantity 1.

K. Mobile cart: Bretford Basics TC15SA or approved equal. Unit shall be welded construction, lower cabinet has 19" rack-mount rails with locking doors front and back, and upper pull-out shelf. Provide rack-mount utility drawer in lower cabinet.

PART 3 – EXECUTION

3.1 INSTALLATION

3.1.1 Complete system shall be installed in strict accordance with the recommendation of the manufacturers as approved by the Architect, anchoring all components firmly into position or long life under hard use.

3.1.2 System equipment locations shown on the Drawings are approximate. Verify exact location s in the field and coordinate these with the Architect.

3.1.3 After the systems have been completely tested, the cables between the sound system equipment cabinet conduit access boxes and the sound system equipment cabinets shall be neatly bundled and held with either nylon lacing cord or nylon cable clamping devices similar to Thomas & Betts "Ty-Rap". More than one bundle may be used if one bundle would be too large to be workable. Provide sufficient loop in the bundle to allow moving the equipment cabinets away from the wall for servicing. Cable bundle(s) shall be securely attached to the equipment.

3.2 INSPECTION AND TEST UPON COMPLETION

3.2.1 Check out of the installation shall be made by the contractor. The system shall be free of short circuits, ground loops, parasitic oscillations, excessive system noise and hum, and instability. The Contractor shall, at his own expense, make any changes required to meet these performance requirements.

3.2.2 Check-out and final connections to the 5120 system shall be made by a factory trained technician in the employ of a manufacturer of the products installed. In addition, factory trained technicians shall demonstrate operation of the complete system and each major component to the Owner.

3.2.3 System field wiring diagrams shall be provided to this subcontractor by the system manufacturer prior to installation.

3.2.4 All materials and installation shall be guaranteed to be free of defects in material and workmanship for one year after final acceptance of installation and test.

3.2.5 Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational manuals have been received.

3.2.6 Upon completion of the installation of the equipment, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

3.2.7 Nothing herein contained shall be construed to relieve the Contractor from furnishing a complete and acceptable electrical wiring system in all its categories. The engineer will condemn and reject any materials or labor which are or may become detrimental to the accomplishment of the intentions of these specifications.

3.3 MAINTENANCE SERVICE

3.3.1 The Contractor shall provide a one-year guarantee of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the Owner. Guarantee period shall begin on the date of acceptance by the Owner or engineer.

3.3.2 A maintenance contract offering continued factory authorized service of this system shall be made available if requested by the Owner.

END OF SECTION 16750

SECTION 16760

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes video surveillance system consisting of cameras, data transmission wiring, recording, storage, and a monitor/control station with its associated equipment. See section 16010, and other sections including the general conditions for substitution requirements.

B. The digital video recorder and associated hardware as described herein shall be installed in the IT closet #131

C. A monitoring location shall be established in Room #104, with a complete station provided. Station shall include two monitors (21" LCD minimum), keyboard, and mouse, connected to the DVR, and installed on a modular computer workstation. Provide all software installation, startup, and programming as necessary for complete viewing of all cameras in real time and playback from the recorded images stored at the DVR.

D. Storage capacity for archived images shall be provided. The total capacity utilizing external hard drive storage devices only shall be as needed for 72 hours of images from a total camera capacity of 16 cameras, at a record rate of 1 PPS per camera.

1.3 ACCEPTABLE MANUFACTURERS

A. Sony
B. Mitsubishi
C. Pelco
D. Samsung
E. Olevia
F. Altronix
G. Samlex

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
2. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
3. Wiring Diagrams: Power, signal, and control wiring, and grounding.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set of points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For cameras, power supplies, monitors, digital video recorders, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data", include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

F. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NECA 1.

C. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 90 percent, noncondensing.

2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non-temperature controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 4 enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. NEMA 250, Type 3S enclosures.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2-PRODUCTS

2.1 CAMERAS

A. Indoor Dome Camera shall be 1/3" Sony 520 Line 0.1 lux with ex-view technology, auto white balance, super backlight compensation, video/OC drive, and audio, with Vandal Resistant Housing a 4-9MM Variable Focus Lenses.

B. Outdoor Bullet Camera shall be same as above but with minimum of 48 LED's with a range of 150 feet and 6-15MM Manual Zoom Auto Iris Lens. Bullet Cameras shall be mounted in outdoor housing.

2.2 LENSES

A. Description: Optical-quality coated optics, designed specifically for video surveillance applications, and matched to specified camera. Provide color-corrected lenses with color cameras.

1. Lens shall be a Variable Focus (zoom) 3.5-8MM or 6.0-15MM depending on area to be covered.
2. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.

2.3 POWER SUPPLIES

A. Power Supplies: Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, type as recommended by camera and lens manufacturer. Provide minimum one power supply per DVR location.

   1. Enclosure: NEMA 250, Type 1 indoors, NEMA 250, Type 4X outdoors.

2.4 CAMERA-SUPPORTING EQUIPMENT

A. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

B. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

C. Protective Housings for Fixed Cameras: 6061 T6 aluminum enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.

   1. Camera Viewing Window: Polycarbonate window, aligned with camera lens.
   2. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
   3. Built-in thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
   4. With sun shield that does not interfere with normal airflow around the housing.
   5. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
   6. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.
   7. Enclosure Rating: NEMA 250, Type 3R.

2.5 MONITORS

A. Monitors shall be 27" LCD Color manufactured Olevia with 1366x768 resolution, 1600:1 Contrast Ratio, 8ms response time and HOMI/Component HD.

2.6 DIGITAL VIDEO RECORDER

A. General Description: 16-camera video multiplexer recorder using JPEG2000 compression and supporting 13 recording rates and 6 recording quality grades. DVR shall display in live mode 60 PPS per channel and display up to 960 on a 16 display pattern. DVR shall record up to 240 PPS with independent settings per channel.

1. Built in DVD/CD R/W +/-.
2. Support the addition of up to 14 external USB HDD's, 6 SCSI-2 HDD's where each drive can be up to 2TB each and a USB Jump Drive.
3. Cascade Capability: Connection of up to 16 DX-TL5000U with keyboard access via to display any video to a master monitor.
4. Include setup wizard to simplify setup and programming.

B. Operations:

1. Local Control: Via GUI from front panel buttons, mouse, keyboard, or wired remote control unit.
2. Remote Operation: Via network software or web browser (limited).

C. Screen Modes:

1. Primary Monitor Output(composite or XGA): Provide access to menu screens, playback and live full screen, sequential full screen, quad, 9, 10, 13, or 16 multi screen displays.
2. Secondary Monitor Output (composite or XGA): Provide playback and live full screen, sequential full screen, quad, 9, 10, 13, or 16 multi screen displays.

D. Record and Playback Functions:

1. Triplex Operations: Simultaneously display live video, record, and playback of specific cameras on a single monitor screen in a multiple display patterns.
2. Record any and all camera inputs as full screen images.
3. Record up to 30 pictures per second (PPS) for one camera and up to 240 PPS total (Field mode), and up to 120 PPS total (Frame mode)
4. Variable record rates and variable record quality allowing user to program each camera independently.
5. User programmable up to 16-character title for each camera and capability to record time, date, and title with each image.
6. Playback Options: Pause, reverse play, forward play, and image by image advance in four forward or reverse speeds.

E. Password Requirements:

1. user-defined password settings each allowing specific access levels to the unit functions, menu and covert cameras.
2. Lock all function, that locks all buttons except for Split/Sequence, Zoom and camera buttons.
3. Password lock to protect HDD recorded information.

F. Archiving:

1. Capability to archive to external HDD or DVD. Provide external HDD storage capacity as required for 72 hours worth of images from 16 cameras per DVR, at a record rate of 1 PPS per camera.

G. Search Options:

1. Time and date
2. alarm number
3. bookmark
4. motion search.

H. Copy:

1. Capability to copy images to a HDD connected to USB ports or NAS port.
2. Capability for simultaneous copy, record, and playback.
3. Capability to apply a digital signature to all images, sequence of images recorded on the
4. DVR.

I. Scheduling Requirements:

1. User definable schedule to switch to day, night, weekends, and holidays. Schedule shall support 2 user definable patterns.
2. Capability to allow user definable pattern settings for camera, record rate, record quality, alarm record rate and quality, archiving, skip, and motion activation.

J. Alarm Functions:

1. Provide Alarm and Alarm Plus Normal activity-recording options.
   a. Alarm shall record images from those cameras in an alarm activity condition.
   b. Alarm Plus Normal shall prioritize the recording of those cameras in an alarm
   c. activity condition, while recording images of none alarm cameras.
2. Capability to send a message on alarm or camera failure.
3. Emergency Alarm input, forcing alarm recording for all cameras.
4. Alarm log list for alarm activities when recorded as alarm on the hard disk, providing
5. time date, camera, and type of event.
6. Provide an alarm log searchable by time and date, camera type, and index, with a quick search function playing back 5 seconds of the recorded information.(when Alarms are recorded as Alarm).
7. Capability to protect alarm and activity recording on separate partitioning of the disk. Partition shall be configurable in GB and have ability to overwrite itself.
8. Capability to notify up to 5 e-mail addresses or 5 IP addresses of an alarm occurrence.
9. Alarm Trigger Events:
   a. DVR temperature.
   b. Fan malfunction.
   c. When an alarm is triggered.
   d. Re-booting of DVR,

e. Record mode is activated
f. HD data storage has reached a specified percent of capacity.

10. Independent or global alarm recording per alarm trigger.
11. Alarm contact (Mode Out 1-4) shall have individual programmable polarity that can trigger telemetry preset.
12. Capability to record multiple cameras per alarm trigger.
13. Support monitor A or B display of last camera in alarm with a default of a 2 second dwell per alarmed camera and return to pre-alarm display capability.
14. Capability to display an alarm condition on the main cascade monitor from any DVR when in cascaded mode.
15. Programmable activity detection per camera with a grid that can be set individually supporting up to 5 sensitivity levels and a triggering threshold setting from 1 to 400. Each setting shall support a test mode for testing set settings.

K. Digital Signature:

1. Apply to recordings and to internal and external hard disk without affecting performance, allowing the authenticity of the digital multiplexed recorded image to be verified.

L. Audio Requirements:

1. 4 channels of audio recording, minimum frame rate of 0.5 PPS.
2. Playback of audio/video in sync when played back from DVR or PC

M. Telemetry:

1. Provide control of single and multi-speed telemetry cameras.
2. Provide PTZ camera support for each channel via RS-422/485/232 including Pelco D, Sensormatic Manchester, Panasonic, JVC, GE, and Samsung PTZ protocol cameras. Also support of Pelco COAX via channel 1 only.
3. Provide local control for each PTZ camera via DVR front panel buttons, optional keyboard and optional with a wired remote.
4. Provide remote control of PTZ cameras via application software when connected via LAN or WAN.

N. Network Functions:

1. Capability to connect to a 100/1000 Base-T Ethernet network.
2. Supports web browser and network (DX-PC55U) application software for LAN or WAN communications.
3. Audio in live mode will be supported by the network software only (DX-PC55U).
4. Include network software and license free to end user.
5. Network software shall support duplex operation enabling live and playback at the same time.
6. Support saving needed data to host PC. Data shall be camera selectable.

7. Support viewing covert cameras over the network by authorized personnel.
8. Provide access to the units event list and its associated video when alarms are recorded.
9. Support storing of digital images to a PC HDD, DVD/CD and USB Memory drive.
10. Playback images copied from DVR to DVD/CD or USB Memory drives.
11. Support up to 5 remote operators to view live or prerecorded images across a network.
12. Support user selectable picture quality settings.
13. Option to set password to prevent unauthorized user viewing of live, recorded images,
14. moving PTZ cameras, controlling the unit, changing the menu system, configuring the
15. network settings and viewing covert cameras.
16. Support Windows XP and 7.
17. Support multiple DVR connections and display them in one screen.

2.7 SIGNAL AND POWER TRANSMISSION COMPONENTS

A. Signal Cable: Coaxial cable elements have 75-ohms nominal impedance. RG-6 min. 60% Braid 100% Foil, plenum-rated jacket. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Compression Connectors.

B. Power Cable: 2-conductor, #14 AWG minimum, twisted, unshielded, jacketed cable.

2.8 NETWORKING COMPONENTS

A. Provide the following as needed to interconnect all DVR's for the purpose viewing real-time or archived video from all cameras:
   1. routers, switches, media converters, and all patch cords as necessary for physical connections.
   2. Software, licenses, and programming for full and functioning operation of the head-end monitoring location.

PART 3 - EXECUTION

3.1 WIRING

A. All coaxial cables shall be installed in minimum 3/4" concealed conduit. Coaxial cable for each camera shall be homerun to DVR location in a star topology. At contractor option, homeruns may be consolidated provided the conduit size is increased accordingly.

B. All camera power supply cables shall be installed in minimum 1/2" concealed conduit. Power supply to cameras may be grouped together in accordance with camera power requirements, and power supply limitations. Follow all manufacturers recommendations. Upsize power supply cable ampacity as necessary to accommodate voltage drop.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. There shall be no splices in signal cable.

E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install exterior cameras 24 inches below bottom of gutter, or as directed by architect, and positioned as required to achieve range of view. Submit all locations to architect prior to rough-in.

C. Install all interior cameras in ceiling, and fully supported from structure above. Cut ceiling tiles as required for neat and professional installation.

D. Install power supplies and other auxiliary components at DVR location, unless otherwise indicated.

E. Avoid ground loops by making ground connections at only the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

F. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pretesting, testing, and adjusting of video surveillance equipment.

B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

C. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video surveillance equipment for acceptance and operational testing as follows:

1. Prepare equipment list described in Part 1 "Submittals" Article.

2. Verify operation of auto-iris lenses. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
3. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away.
4. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
5. Set and name all preset positions; consult Owner's personnel.
6. Set sensitivity of motion detection.
7. Connect and verify responses to alarms.
8. Verify operation of control-station equipment.

D. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.

E. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

F. Remove and replace malfunctioning items and retest as specified above.

G. Record test results for each piece of equipment.

H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's utilization of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.5 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video surveillance system components, including camera-housing windows, lenses, and monitor screens.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video surveillance equipment.

1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.
2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Review equipment list and data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Conduct a minimum of six hours' training as specified in instructions to Owner's employees in Division 1 Section " Demonstration and Training."

END OF SECTION 16760

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